From **Ohio:** 16—*Cleveland*, Mr. and Mrs. H. C. Dobbins, Adela Gaede, Warner Seely, Mildred Stewart; *East Cleveland*, Vera Carrothers; *Painesville*, Mrs. Robert V. D. Booth; *Poland*, Mr. and Mrs. Evan C. Dressel; *Steubenville*, Mr. and Mrs. Clinton S. Banks, Earl W. Farmer; *Toledo*, John M. McCormick, Mr. and Mrs. Albert R. Tenney, Robert H. Turner.

From **Pennsylvania:** 9—*Allport*, Elsie C. Erickson; *Butler*, Mr. and Mrs. Frank W. Preston; *Chester Springs*, Mr. and Mrs. Phillips B. Street; *Kane*, Sybil K. Kane; *Mt. Jewett*, Mrs. Florence Kane Johnson; *Pittsburgh*, Kenneth C. Parkes, George B. Thorp.

From **West Virginia:** 2—*Huntington*, Ralph M. Edeburn; *Morgantown*, Maurice G. Brooks.

From **Wisconsin:** 1—*Madison*, John T. Emlen.

From **Ontario, Canada:** 14—*Fort William*, A. E. Allin; *Guelph*, Alex T. Cringan, H. G. Mack, A. de Vos; *Hamilton*, Eric W. Bastin, R. G. C. MacLaren, George W. North; *Pickering*, Mr. and Mrs. J. Murray Speirs; *Toronto*, J. Bruce Falls, Mr. and Mrs. William W. H. Gunn, Frederick M. Helleiner, Mrs. Osborne Mitchell.

From **Argentina:** 1—*Buenos Aires*, William H. Partridge.

From **Denmark:** 1—*Copenhagen*, Finn Salomonsen.

POISONS AND WILDLIFE

A Contribution from the Wilson Ornithological Society Conservation Committee

The empirical title of this article is an admission of the broadest possible consideration, here, of the relationships of animal-control poisons to wildlife generally. Indeed, this discussion cannot be a coverage, however broad, of a subject handled only inadequately in many papers and texts; rather, it is an attempt to sketch the amazing scope and application of poisons used in control, and to contemplate their mass impact on mammals, birds, fish and other life esteemed by man.

In this attempt, the commentator wishes to be objective. Poisons, with affinities for both production and destruction of valuable crops, are obviously two-sided in significance; no discussion, even in a medium dedicated to resource appreciation and management, should overlook poison's role in the provision of man's food and fiber, to say nothing of his health and well-being. This, then, is neither approval nor denunciation of poisons *per se*; it is a plea for facts based on objective and controlled research; and moderation in the use of new, highly toxic poisons until such information is available.

Some agricultural remedies involving poisons are now so widely accepted that they are taken as a matter of course. The use of lead arsenate in potato-bug control is illustrative, though but one of scores of examples. Thousands of poison compounds—organic and inorganic, natural and synthetic—are known, but probably not over 100 are actually employed in insecticides. Others are being introduced at a rapid rate.

Herbicides, or plant-killing compounds, are newer, but they have a manifest potential in the field of plant control as great as insecticides and related poisons in animal control. Even less is known of their ultimate effects on birds and mammals than those of the older, longer-used animal-control poisons. Many of these effects are from the standpoint of cover, which also represents, directly or indirectly, an important source of wildlife food supply.

It is unfortunate, indeed, that insecticides and herbicides collectively—so dramatically

successful for the specific purposes for which they were developed—constitute a serious threat to exceedingly valuable wild-animal life.

It would seem that the greatest threat to wildlife inherent in insecticidal and herbicidal poisons lies in their prodigiously increasing use, particularly in cases where their effects on wildlife have not been adequately determined. Some idea of the tremendous volume of poisons used is indicated by the following figures:

In the United States, largely in the control of cotton insects, 20,000,000 pounds of calcium arsenate and 30,000,000 pounds of lead arsenate are used annually.

In the United States, in 1952, about 85,000,000 pounds of DDT and 92,000,000 pounds of benzene hexachloride (BHC) were used, most of it being distributed by plane.

The amazingly rapid increase in the use of *synthetic* organic insecticides is indicated by these figures: 1940—287,500 pounds; 1942—2,217,000 pounds; 1944—16,205,000 pounds; and 1952—225,000,000 pounds. The increase from 1940 to 1952 was over 781 per cent, or an average increase of more than 66 per cent per year! These totals do not include *natural* organic and inorganic insecticides. The total volume of insecticides used in North America each year is about 300,000,000 pounds!

Figures for the total *area* to which insecticides are applied likewise are staggering. In broad summary, it can be said that insect-control poisons of one sort or another, up to about 60 pounds per acre, are applied annually to land that produces approximately one-half of our food, forage, and fiber, and a small part of our timber. An estimated 80,000,000 acres are annually involved!

Herbicides are newer, as stated. They affect wildlife chiefly by modifying, and sometimes destroying, the habitat. Both herbaceous and woody vegetation are involved, as are grasses and aquatic plants. Herbicides have not yet attained the use, either in volume or area, characteristic of insect-control poisons. Their potential, however, may be as far-reaching: field borders, fencerows, and indeed the fields themselves, are being sprayed with brush- or weed-killers in every state; and thousands of miles of roadsides, and great lengths of railroad- and transmission-line right-of-ways, are similarly treated. See a later statement concerning benefits.

Finally, there are plans for turning parts of the sagebrush plateaus of the West into grassland in the interest of more and better livestock range. This interest was exemplified in the 1956 Annual Meeting of the American Society of Range Management in Denver, when two half-day sessions were devoted to this subject. The first was entitled, "Control of Undesirable Vegetation"; the second was under the heading, "Possibilities and Economics of Improving Range Land Through Management, Improvements, Weed and Brush Control, and Reseeding." Another possible use for herbicides in the West, now in the testing stage, is in the control of pocket gophers on high-country range. The application lies in the killing of weeds, the preferred cover and food source of the pests. The ironical note is that weeds, now considered a major problem on western ranges, apparently gained their present dominance through the over-grazing of intermixed grasses, primarily by livestock! If accompanied by capacity-rated grazing pressure, herbicides may indeed be the expensive cure, or partial cure, to this instance of wide-scale misuse! No one knows what it will do to birds and mammals.

The history of economic and industrial development in America is replete with resource abuse. One needs only to point to the loss of one-fifth of the top soil from cleared lands; polluted waterways in every state; oil slicks along coastlines; the "cut out and get out" lumbering policy; fantastic waste of gas and oil in some drilling and pumping operations. There are scores of lesser examples. Broadly speaking, the use of insecticides to date has been relatively unrestricted, since frequency and volume of application are in almost all cases the prerogative of the operator. To be

sure, dosage and directions for use, as provided by the manufacturers or agricultural bulletins, afford safeguards of very real value, but, properly perhaps, with emphasis on crop protection and economics rather than safety to game and fish. Therefore, only inadequate consideration has been given to wildlife interests, regardless of their economic, recreational, or aesthetic value. Exceptions have been the very valuable work of institutions and government agencies, often under pressure to provide, or approve, *quickly*, the needed poison for insect or pest control.

It will be of interest to note the use, and regulation of use, of herbicides, which obviously appear to be on the threshold of countrywide employment as vegetation controls. With specific or semi-specific preparations for most vegetative types—broad-leaved forbs, woody growths, grasses and sedges, and aquatics; with methods of application ranging from hand to airplane; with costs far lower than control by machine or hand labor; and with results more certain, or even selective, there is little doubt that use, if permitted, will increase in mushrooming proportions. There will certainly be proposals for region-wide programs of vegetation control—as per sagebrush eradication already referred to—in the interest of a particular group or industry. The ultimate loss to birds and other wildlife, in such events, will seemingly be in proportion to the net destruction of habitat. Transition from sagebrush to grazed grassland, as an example, does not promise improvement in the native fauna.

In appraising the relationships of poisons to wildlife, even in over-broad terms, there are a number of things for conservation folk to be thankful for: (1) insecticide loss to birds and other wildlife is due mainly to secondary poisoning, the result of eating poisoned insects and other life. Toxicity of poisoned insects to birds and mammals is generally lower (in some cases, much lower) than is the insecticide to insects. Lethal dosage from this source of ingested food is far less probable than from primary poisoning, such as the spectacular results obtained from strychnine-treated grain in blackbird control.

(2) The most highly toxic, non-antidotal poisons, such as sodium fluoroacetate (1080), are strictly controlled by governmental agencies and are released only under bond or other trust to responsible persons.

(3) There is considerable research into the effects of insecticides, though much less on the effects of herbicides, on wildlife. Most such studies are activated concurrently with, or after, the poisoning operation. California, Alabama, Wyoming, Washington, Connecticut, Ontario, and numerous other states and provinces have conducted, and still are conducting, valuable studies in this field.

(4) Control of vegetation with herbicides, at least under certain conditions, may be beneficial to wildlife, including game birds, according to a recent study in Wisconsin. In this case, the plant successional stage is changed to the advantage of Sharp-tailed Grouse. Any species profiting from the transition of dense woody cover to grass and weeds might be similarly affected. Somewhat similar results have been indicated on sprayed right-of-ways in New England. Minnesota has reported that aerial sprays are an aid to forestry. Fortunately, the interested agencies in this case appear to be making carefully controlled studies before launching a statewide program. They claim that: "Tests have proved conclusively that the herbicides used are not harmful to wildlife and fish." This presumably, is in reference to direct poisoning; there is no statement concerning the effect to wildlife of changes brought about by ". . . plantation release . . ." or ". . . control of fast-growing weeds and the suckers or sprouts of such broadleaf trees as aspen, birch, and oak . . ." This is deer food *par excellence*.

On the other hand, reasons for apprehension on the part of game conservationists

grow out of certain characteristics of some of the poisons used. For example, hydrocarbons such as DDT, Toxaphene, and Dieldrin may be cumulative in their toxic effects. Thus, single exposures may not cause mortality, but repeated applications, in the same year, or in successive years, may attain lethal concentrations in game birds, and presumably in others. If not killed, physical damage to vital organs or processes may result. Wildlife populations may thus be affected by such insecticides in three ways —outright killing, delayed killing, or a decline in the reproductive rate of the population.

A precise evaluation of wildlife losses, direct and indirect, from control poisons is presently impossible, despite the certainty of attrition and the availability of a literature encompassing several thousand titles. The inability of even an informed analyst, to say nothing of this layman writer, to make such an evaluation is due to nothing more than the lack of results from controlled experimentation; for as stated, most wildlife-poison studies have been of an ". . . after the horse is stolen . . ." variety.

This discussion has been generalized purposely in an effort to be fair to both sides— both legitimate in primary objectives—of an intricate and controversial problem. But in a field as vast as that of insecticidal and herbicidal poisons, one as relatively new and unstudied, and one particularly lacking in the results of objective and controlled investigation, no empirical generalization can be made. The reviewer can only conclude: *There is probably no more needed or opportune field for wildlife research.*

As an obvious recommendation, therefore, the writer urges intensified investigational programs on the part of institutions and governmental agencies, and by wildlife agencies, to the end that factual information ample for sound, renewable, natural-resource management is made available. Such knowledge is not now at hand. The need for it will almost certainly become more acute before the conflict of interest inherent between wildlife values and even legitimate plant and animal control is resolved. Other control programs, involving wide-scale use of new, highly toxic, and inadequately tested poisons, may prove tragic indeed, if enacted.—Lee E. Yeager.

LETTER TO THE EDITOR

The review by Irby Davis of Eugene Eisenmann's "The Species of Middle American Birds" (1955. *Wilson Bull.*, 67:317–318) demands answering comment for a number of reasons. It would be unfortunate if this extremely valuable book did not reach the readership it deserves merely because it does not agree with the personal views of the reviewer in one minor aspect, that of vernacular names.

Indeed, the overwhelming concern in this review is this matter of the selection of common names, and the very first sentence reads, "The main purpose of this little book is to provide a suggested list of English or common names for the benefit of persons visiting Mexico or any of the Central American countries." May I point out a few errors in this sentence? First, the basic purpose of this book is not to provide a list of common names; its purpose and great value is that it provides, *for the first time, a complete and up-to-date check list of the species of birds recorded in Middle America.* In doing so, Eisenmann has done a great service not only to *visitors* to this region, but to all students of the ornithology of the area. It is a complete species list as correct in its scientific nomenclature as is currently possible (with copious footnotes explaining alternate points of view), with a summary of the range of each species, including many unpublished or previously unorganized data; it includes an excellent regional bibliography. The same first sentence seems to imply that the emphasis is on Mexico, which is not true, nor is the book a handy guide for the